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HATCHING AND REARING OF CHICKS

BY

J. E. DOUGHERTY

Chicks taken from the brooder after they were old enough to do without artificial heat and put out on range in colony houses.

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Vigor in Breeding Stock. The first and most fundamental requirement for the production of strong, healthy chicks, is healthy breeding stock. We cannot expect fowls to produce eggs with strong embryos unless they, themselves, are full of health and vigor. Health is that condition of a fowl's body in which every organ and every body cell is doing its full share of work and running smoothly. Unless a hen is in splendid health, she cannot devote her best energies to the production of vigorous chicks. If a fowl used for breeding is at all weak or diseased, every energy of the body organism is devoted to ridding it of its unhealthy condition; and the reproductive organs, which in health would be turning all their efforts to the production of strong, fertile eggs, must lend their aid in ridding the body of disease germs.

Breeding stock lacking strong vitality and vigor produce eggs with weak embryos, which in turn produce poor hatches of weak, puny chicks. Constitutionally vigorous breeding stock, on the other hand, is bound to lay eggs with strong germs, and such eggs cannot help, if given half a chance, hatching robust, healthy chicks. As one well-known poultryman puts it, "Chicks from vigorous breeding stock will hatch and grow in spite of you, they're so vigorous and strong." Healthy chicks are easy to rear with ordinarily good care because their very vigor and health act as a buffer against disease and dietary troubles.

Selecting Vigorous Breeders. The constitutionally strong bird should have a sleek, well-groomed appearance, a confident, proud bearing, and clean-cut action. The head should be blocky, the beak short and blunt, eyes round, full and richly colored, wattles and ear lobes quite smooth, well developed and of good bright color. The comb should be of good size, well set on the head, smooth in texture and of a rich red hue. A popular axiom among poultrymen is that the hen carries her health certificate on her head. A long thin beak, dull, snaky eye, with hollows in front of the eye socket, and pale, anaemic comb, do not exist on the constitutionally vigorous fowl.

The body must be deep and broad with a good full breast, wide back, and well-developed abdomen. The legs too must be stocky and

set well apart, with the thighs well muscled and the shanks showing good color and sturdy appearance. Last, but not least, are the toes. The length of a hen's toe nails indicates her worth. A busy, active hen will have short, stubby toe nails from digging and scratching so hard, whereas a lazy or weak hen will be disinclined to work, and as a consequence, its nails will be long and curved.

The principal point of the whole question is that the vigorous breeder is the healthy, active one with a well built, roomy body in which the egg organs are in fine condition to withstand the strain of reproduction and have space enough to develop large, strongly fertile eggs. Good housing, abundant range, and proper feeding are half the battle in producing strong eggs for hatching. The other half is an intimate knowledge of vigorous birds and a willingness to cull out those that are inferior. It takes both halves to bring success. One is useless without the other.

Breed from Hens. The production of a large egg containing a strong embryo and plenty of nourishment requires that a hen possess well-matured reproductive organs. It is necessary that the embryo not only have plenty of space within the shell in which to grow but also be supplied with an abundance of food materials with which to make that growth. A pullet does not ordinarily possess reproductive organs sufficiently well developed to produce such an egg. Therefore, a pullet does not produce as good hatching eggs and is not as desirable for breeding purposes as is the yearling hen. The pullet must necessarily utilize some of her energies in further growth and development. After attaining her full size, she still has to fill out and mature, as well as strengthen her laying organs through use.

Among the Mediterranean class of fowls such as the Leghorn and Minorca, the males seem to develop sexually more rapidly than the females. Well-developed Mediterranean cockerels are therefore very often used as breeders when mated with yearling hens. The ideal mating, however, for breeding purposes, is that of vigorous yearling cocks with well-developed yearling hens.

Care of Breeding Stock. Having selected the most vigorous fowls as breeders, their continued health can only be maintained by good housing, good feeding and good care generally. In other words, the breeders must be so cared for that they are both *comfortable* and *contented.*

The houses should be of the open front type so that the fowls are supplied with an abundance of fresh air at all times without drafts. Small cracks and knot-holes through which drafts of cold air can

reach the birds cause them to catch colds and develop "running noses." Colds are dangerous to the vigor of the hens because they prepare the way for those other justly dreaded diseases, *Roup* and *Canker*. Every poultry house must be absolutely tight and draft proof on three sides, if the health of the fowls is to be maintained and best results secured.

The fowls need a dry, protected place where they can dig, scratch, and bask in the sun on cold, wet days. A scratching pen therefore is an indispensible part of a good, comfortable house. Where roosting houses only are used, the hens are forced either to remain on the roosts during stormy days or else paddle around in the rain, becoming wet, bedraggled and chilled through. Such conditions being so utterly lacking in comfort, quickly reflect themselves in a falling off of the egg yield, a lowering of the general vigor of the flock and the production of weakly fertilized eggs. The results secured in the poultry business are in direct proportion to the care and attention given to the comfort of the fowls.

If possible, the breeders ought to have free range. Plenty of range stimulates hardiness and vigor, which make for hardier offspring. If free range for the breeding fowls is out of the question, give them as much ground to roam over as can be spared for the purpose. The results obtained in vigor of the chicks hatched will make it well worth while.

On free range, good vigorous males will often care for from twenty (20) to twenty-five (25) females, but when confined in limited space the male is not so active and ten (10) to fifteen (15) females to each male is about right. The amount of service a cock will give depends a great deal on the bird. A vigorous, proud, combative male will care for a large number, whereas another less sturdy one will serve only a few.

The cock that calls to his mates when he finds a choice morsel and then stands proudly by, while they eat it, is the one that makes the best breeder. Such gallant cocks need to be watched to see that they eat enough, for they will invariably stand back and let the females fill up before eating a bit themselves. The strong breeding male is also a ready fighter. The bird that will not show fight when the keeper pokes his foot at him is lacking in that fighting spirit, which is one of the strong points of a choice male, and the cock that has once been thoroughly whipped is never as good a breeder afterwards. Gallantry and the fighting spirit are unfailing signs of the hardy, vigorous, breeding male.

During the mating season, an active male will often get out of condition from serving the females too frequently. For this reason the males should be removed from the pen, one at a time, so that each one will get a couple of days' rest per month in a coop by himself and entirely away from the females. One service will fertilize the eggs for five to fourteen days, so that there is no danger of causing any lowering of fertility by giving the males a needed rest each month.

Feeding the Breeders. Spring, the natural breeding season, is the best time to hatch strong hardy chicks. The hens, at this season, are in prime breeding condition and produce a greater per cent of vigorous chicks from the eggs set than at any other period of the year. It being the natural mating season, all the energies of the fowls are bent toward the production of young. Therefore, the breeders should be so handled as to retard laying until Spring.

The fowl that lays all Winter has had too great a drain on her reproductive organs to be in condition to lay strongly fertile eggs for hatching. When Spring comes, those of her eggs which prove fertile may not only possess weak germs, but many of them will be infertile because the male instinctively pays much more attention to those hens just beginning to lay than to those that have been laying continuously for quite a period. Thus hens beginning to lay in the Spring not only receive more attention from the males, but are in condition to produce strong eggs because they have not undergone the strain of heavy Winter production.

Feed largely of grain during Fall and Winter and remove all forcing feeds from the mash. Green bone and green stuffs such as kale, roots, sprouted barley, etc., should be fed sparingly and no stimulating foods used at all. Give all the exercise possible.

The aim with breeding fowls is to save up all their strength and energies so that they can instill every atom of their vitality into the hatching eggs laid in the Spring. Quality not quantity is what is wanted from the hens that produce the chicks.

Selecting Eggs for Hatching. Care and judgment should be exercised in the selection of the eggs that are to produce the future layers. These eggs should be rigidly selected for (1) size, (2) uniformity of size, (3) shape, (4) uniformity of shape, (5) color, (6) uniformity of color, (7) shell texture. Eggs with weak shell texture break very easily when being turned during incubation. Those that are either too large or too small make the work of turning more difficult because of the lack of uniformity in size. Brown eggs ordinarily hatch approximately twenty-four hours later than white eggs, and it is

therefore not advisable to mix brown with white eggs in the same incubator. Further the good sized egg will hatch a heavier chick than a small one. The small chick is seriously handicapped when forced to compete for food and warmth with the larger and stronger ones.

Like tends to produce like. If constant and rigid selection along the above lines is practiced in picking out the eggs for hatching it should follow that uniformly good chicks will be hatched. If the shape and size of an egg are inherited characters, continued careful selection of hatching eggs should result in the development of a flock, in a few years, in which all the hens will lay uniformily large, well-shaped, evenly colored eggs of good shell texture. Size must be an inherited character because the laying of large eggs is a breed characteristic of the Minorca. Color of eggs is also a breed character. Therefore it is reasonable to assume that the selection of choice eggs weighing from twenty-four to twenty-six ounces per dozen, and which have been carefully selected for uniformity of size, shape and color, will not only make the handling of those eggs during incubation easier but will result in the building up of a flock that will average a larger percentage of "extras." Every increase in the number of good sized eggs laid by a given flock means an increased profit to the owner.

Keeping Eggs for Hatching. Eggs intended for hatching should be kept in a dry place and at a uniform temperature of about fifty degrees F. A rack of drawers built against the wall of a cellar is a good place to save eggs. The drawers should be pulled out and the eggs turned once daily. Another simple scheme is to pack the eggs in a thirty-dozen case as they are selected each day. The case can be laid on its side one day, its top the next, the other side the next and so on so that the eggs are turned a little each day. Hatching eggs ought not to be over two weeks old when set. The sooner they are set after the animal heat has left them, the better.

INCUBATION

Natural Versus Artificial Incubation. Unless the flock is large enough to warrant the use of at least a medium-sized incubator, it is better to continue using hens. However, where conditions warrant, the use of an incubator means a big saving in labor, and the bother of waiting for broody hens is eliminated. Moreover, hatching can be done whenever desired and the chicks will be more free from lice than hen-hatched chicks, unless extra care is taken in dusting the hen.

Hatching with Hens. The best results will be obtained when the hens are set on the ground. Repeated experiments have demonstrated that where hens were set in this way stronger, bigger chicks were hatched than from those set in nests that were off the ground. If it is not convenient to build outdoor nesting coops or there is no shed

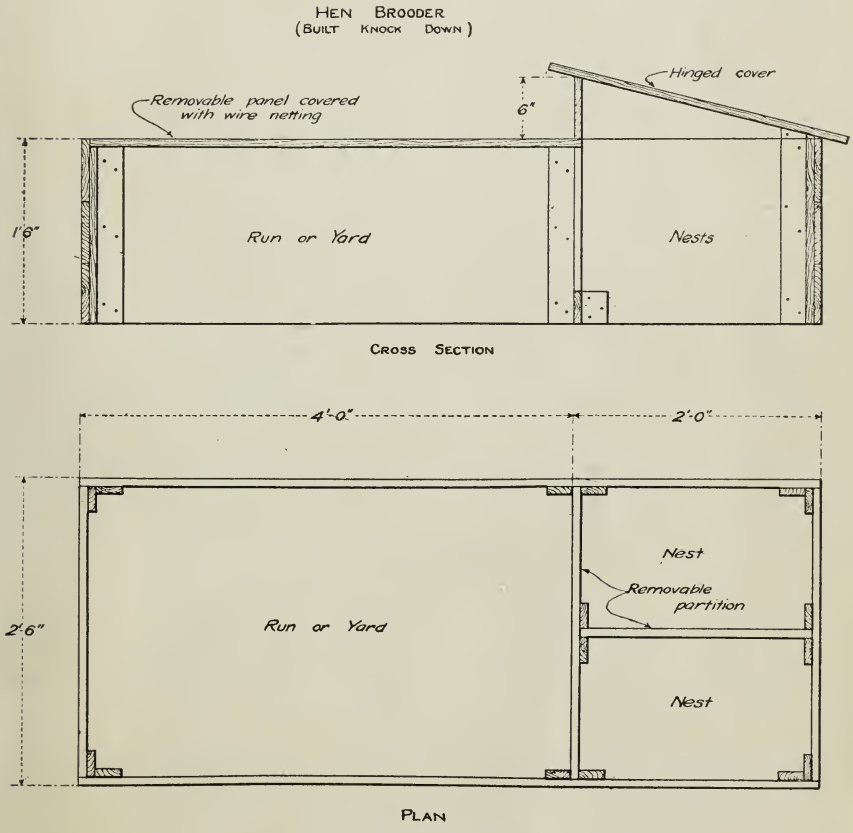


FIGURE 1.

NOTE.—Three screws at each corner are all that are needed to assemble above brooder ready for use. Partition between nests slides in grooves between cleats. Cover lifts off.

available with a dirt floor, and the hens have to be set in nests with wooden bottoms, cut a square of fresh sod and lay it in the bottom of the nest box just before the eggs are put in. Then put on top just sufficient straw to hold the eggs in the center.

The setting hen coop shown in Figure 1 is a very simple and convenient one in which to care for Biddy and her brood. The reader will observe that there is a removable partition in the rear part of the coop. This partition is left in at first so that two hens can be set at a time. The coop has no bottom, but is set out in the field on the ground. When setting the hens, a square of sod is placed in each nesting compartment so as to raise the eggs above the ground level, and the straw nest is made upon the sod. The hens should be allowed to sit on china eggs for a few days before giving them good eggs, in order to let them get used to the coop, and also to see if they are really in earnest about wishing to set. Just before putting the good eggs under them, the hens should be dusted with an effective lice powder, (see page 20) and a little of the powder sprinkled over the nest.

As soon as the two hens have brought off their chicks, the egg shells and old nesting materials should be cleaned out, the partition removed and all the chicks given to one hen. The other hen can then be reset with another in a similar coop and allowed to keep her second brood. Both hens should be dusted again at this time.

In that portion of the coop covered with the movable wire panel are kept the feed hopper and water pan for the hens while they are setting. This space is large enough to allow the hens to stretch and dust while setting, and for the young chicks to run in for the first few days. Later both hen and chicks can be allowed free range, for they will return to the coop at night.

How to Run an Incubator

The Lamp. The lamp should be thoroughly cleaned, the burner boiled in soda water and a new wick put in before the machine is started.

In beginning the hatch, use a medium flame and adjust the thermostat to that flame. If too small a flame is used to start, at end of hatch in warm weather, the flame cannot be turned low enough to keep the temperature from running up. If too high a flame is used the lamp will smoke.

The lamp should be cleaned and filled every morning *after* turning the eggs. If it is filled before turning the eggs, the hands being smeared with oil from the lamp, will leave a coating of oil on the eggs and cause serious injury to the growing embryos. Trim wick with a burnt match after filling by simply rubbing off the charred crust, and then wipe away all dirt and oil from all parts of lamp before replacing in the incubator. Do not ordinarily trim wick with scissors.

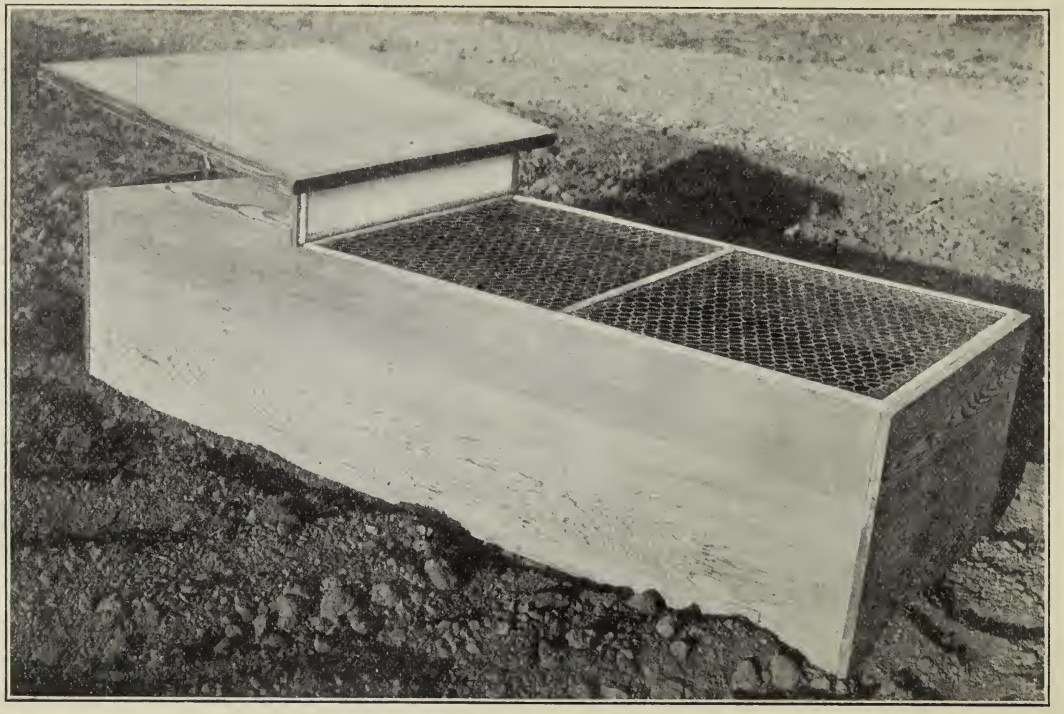


FIG. 3

A very satisfactory setting hen coop. It is built knock-down and can be stored away in a small place when not in use.

Disinfection. Before and after every hatch, the incubator should be thoroughly washed and sprayed and the movable parts placed in the sun to dry. Thoroughly cleanse every part with soap, water and a good scrubbing brush. A few hours before putting in the eggs spray all parts of the interior with a spray pump using some good disinfectant such as cresol, a five per cent solution of carbolic acid, or any of the "eum" preparations. The fumes of the disinfectant will not only penetrate every crack and cranny, in the hot interior of the egg chamber but will also disinfect the exterior of the eggs and kill any bacteria or mold spores that may be on the surface of the shells.

Locating the Incubator. Put the machine in a room where the temperature remains fairly uniform at all times and where there is plenty of ventilation without drafts. A cellar is usually best because it is well protected from the direct rays of the sun and the temperature is uniformly low. The proper temperature for an incubator room is sixty degrees F. In this climate, good ventilation is easily secured by removing the windows and inserting in their stead frames covered with light muslin. The air will pass through the muslin, but all winds will be shut out.

Having located the incubator, level it with a spirit level and see that all parts are in satisfactory working order. Leveling is *very* important, for if the machine is not level, it means that one part of the egg tray is higher, and the eggs in that part of the tray are therefore getting more heat than the others.

Beginning the Hatch. Start the incubator a few days before putting in the eggs to warm it up. After the machine is thoroughly heated up continue to adjust the regulator until the temperature remains steadily at 102 degrees F. for twenty-four hours, with center of thermometer bulb on a level with top of eggs. When the operator is sure that the regulation is correct the eggs should be put in. It is usually best to do this in the morning so that the eggs may become warmed and the temperature returned to 102 degrees F. before bed time.

After the eggs are put in, the temperature will drop and return very slowly—but do not touch the regulator. The temperature will readjust itself to 102 degrees F. again in a few hours, or as soon as the eggs become heated. After careful adjustment of the regulator before putting in the eggs it is not necessary nor advisable to touch it again until the second week, when the temperature should be raised to 102½ to 103 degrees. Do whatever daily regulation is required by raising or lowering the flame.

Thermometer. In order to be certain that the thermometer is correct, the operator should test it himself with a clinical thermometer. Place both thermometers in luke warm water and while stirring, add hot water slowly until the clinical thermometer registers 103 degrees, and observe whether the incubator thermometer gives a similar reading. If not, the operator knows that at 103 degrees the incubator thermometer reads, say, 102½ degrees, and must allow for this error in running his incubator. Faulty thermometers have caused more damage in the way of poor hatches than is generally realized.

Temperature. In all incubators the temperature is regulated or controlled by a thermostat. The all metal thermostat (see figure 2) consists of three pieces of metal riveted together at the ends and is designed on the principle that different metals expand different definite amounts for every degree F. rise in temperature, and contract the same amounts for every degree F. fall in temperature. The central piece of metal (h figure 2) does not expand or contract as much for each degree of change in temperature as do the two outside pieces. As a result, since all three pieces are riveted at the ends, the two outside pieces, ex-

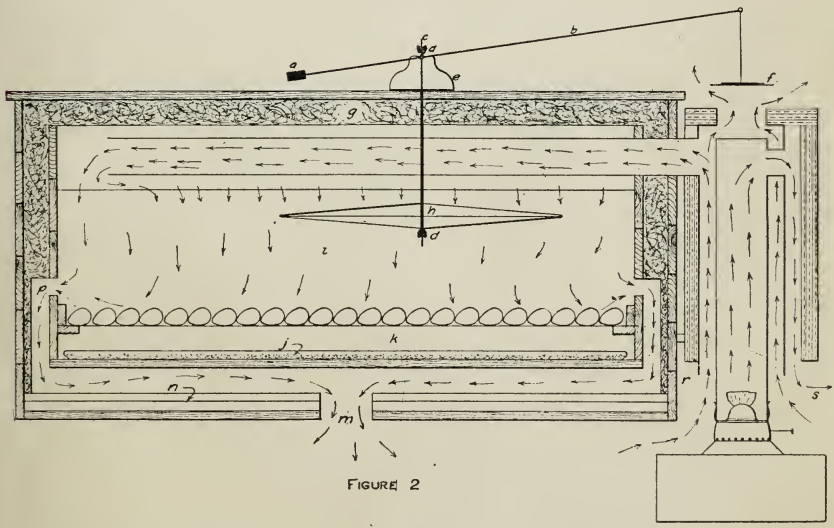


FIGURE 2

(*a*) Counterpoise weight. (*b*) Regulator arm. (*c*) Connecting rod. (*d*) Thumb nut. (*e*) Pivot casting. (*f*) Heater disc. (*g*) Cotton batting filling between inside and outside cases. (*h*) Thermostat. (*i*) Egg chamber. (*j*) Moisture pan filled with sand kept wet. (*k*) Nursery. (*m*) Bottom ventilator for escape of air from egg chamber. (*n*) Insulation in bottom of incubator. (*p*) One of four pipes to discharge air from above level of eggs into false bottom beneath egg chamber. (*r*) Fresh air intake. (*s*) Outlet for escape of lamp fumes. No fumes can get into machine.

Cross-section of a hot air heated incubator showing the method of regulating the temperature, the ventilation system, and the general construction.

panding more rapidly than the center piece, when the temperature rises, are forced outward in the middle. This buckling or spreading apart of the two outside pieces of metal in the thermostat causes a downward pull on the connecting rod (e), which in turn pulls on the lever arm (b) and raises the disc (f) off of the heater, allowing the surplus heat to escape.

When the temperature in the incubator rises *above* the desired temperature, the expansion of the thermostat lifts the disc from ½ inch to 1½ inches above the heater allowing the surplus heat to escape. But just as soon as the temperature returns to its proper place, the disc lowers again. If the temperature of the machine should drop, *below* the running temperature, the thermostat will contract and allow the disc to settle down on the heater, tightly closing the opening and forcing all the heat into the egg chamber.

There are a number of different kinds of thermostats and heat regulating devices used on different makes of machines, but they are all based on this principle of the expansion and contraction of a thermostat to control the amount of heat entering the egg chamber.

In the type of heater shown in figure 2 the *fumes from the lamp cannot get into the egg chamber*, but must escape through the opening (s). The fresh air (as shown by arrows) is heated by the lamp as it is drawn into the opening (r). It passes into the top of the incubator and then diffuses through a burlap or muslin diaphragm into the egg chamber. After circulating around the eggs and absorbing the carbon dioxide thrown off by the eggs and giving up oxygen, the air current then passes through the openings at the sides of the egg chamber and escapes through the bottom of the machine.

For the first week the temperature should stand at 102 degrees, the second week at 103 degrees, and the third week at 103 degrees where the *center of thermometer bulb is on a level with the top of the eggs.* Hanging thermometers having center of thermometer bulb above the tops of the eggs need to be run higher according to the height of bulb above eggs, because the heat comes into the egg chamber from the top and the nearer the thermometer is to the top of the egg chamber the higher it will read when a standing thermometer on a level with the tops of the eggs registers the correct temperature. While chicks are hatching, it can, and invariably does, run up to 104 degrees without doing any harm.

Moisture. Some machines use moisture, some do not, but all *need* moisture, except when the weather is very damp. One of the best ways to supply this moisture when using a non-moisture machine, is to keep

the floor well soaked. The evaporation of moisture is in proportion to the surface of water exposed to the air, so that wetting down the floor exposes a large water surface and enables the air to become well saturated *before* entering the incubator. The purpose of such moisture is not to supply it to the egg but to keep the air entering the incubator moist enough not to take up moisture from the eggs and thus rob the embryo of the water it absolutely needs in order to develop into a strong lusty chick.

Ventilation. During the growth of the embryo it has for its food supply the stored up food within the egg. In the digestive and assimilative processes through which this food has to go, while being changed into body tissue, heat, and energy, oxygen is absolutely necessary. Without oxygen these processes could not go on and the embryo would die. The blood is the great stream which carries oxygen to the body cells of the growing embryo and carries away the injurious carbon dioxide which these cells throw off. If an egg is held before the tester on the 7th day, a net work of blood vessels can be seen just under the shell and near the air cell. The blood stream carries the waste product, carbon dioxide through this network of vessels lying so close to the outside in order that it may escape through the pores of the shell or into the air cell.

Therefore plenty of fresh air is essential to the production of strong, vigorous chicks, because, during the process of growth taking place within the shell, the egg gives off carbon dioxide and takes up oxygen just as a person in breathing exhales carbon dioxide and inhales oxygen. In order to carry off carbon dioxide "exhaled" by the growing embryo and supply it with all the oxygen it needs, a good system of ventilation (see figure 2) is necessary. Unless that ventilation is such as to carry fresh air into the egg chamber as rapidly as it is needed and carry away the carbon dioxide as rapidly as it is given off by the eggs, the embryos will not thrive as they should, and the resulting chicks will lack vitality. In the better types of incubators, the ventilation system is good and works automatically, thus relieving the operator. Always follow the directions accompanying the incubator until sufficient experience has been gained to enable the operator to act intelligently in making any change that appears advisable. Experience with the machine may prove that the change first thought necessary may not be at all a good one. When the chicks are all hatched, open the side ventilators wide to give them plenty of air. If they still pant, take a match stick and wedge the door open a little.

Turning. Begin turning after 24 hours and turn morning and night until the 19th day. Make the turning periods as near twelve hours apart as possible. Turn for the last time the morning of the 19th day if eggs are not pipped, otherwise do not turn on the 19th day, but leave the machine closed, and do not disturb again until after hatch is finished.

In turning roll the eggs slowly with the palms of the hands—they will not break. It is not necessary that the eggs be completely turned over. All that is required is that the egg be shifted around and shaken up a little so that the embryo will not stick to the shell. Rolling the eggs with a rotary motion of the hand exactly answers the purpose and is rapid.

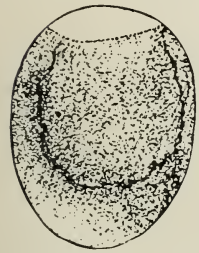
Cooling. The purpose of cooling is to thoroughly air the eggs and strengthen the embryo. It corresponds to the opening of the windows by the housewife and airing the bedroom each morning. The incubator door should not be left open while cooling. The aim is to cool the eggs, not the incubator. The hen's body temperature is the same when she returns to the eggs as it was when she left them. So it should be with the incubator.

In setting the eggs out to cool do not allow part of the tray to project beyond the table or incubator, or the eggs will cool unevenly and those in the projecting part of the tray will become chilled by the time the others are ready to go back into the machine. Begin the cooling the 7th day and cool every evening when eggs are turned. Cool a little at first and gradually lengthen the cooling period as the hatch advances. A most satisfactory way to tell when the eggs are cooled sufficiently is to hold the small ends of a few to the eye. When they feel barely warm the eggs are cooled enough. A little experience will make one expert in gauging the cooling period. They will cool down very rapidly at first, but as the embryos develop and contain animal heat of their own they will cool down very slowly. In the month of May, 20 to 60 minutes is often required to cool eggs that have been 14 to 18 days in the incubator. The amateur usually errs on the side of too little rather than too much cooling.

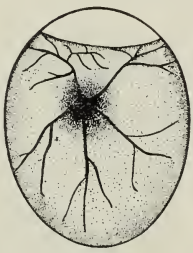
Testing. Test on the 7th and 14th days at night, because that is the time the cooling is done. The first test will remove all infertile and dead germs up to that period. The infertile eggs are still perfectly good and can be used in cakes. The writer has known them to be so used and considers them as good as cold storage eggs for cooking purposes. The dead germs at 7th day test contain either blood clots or blood rings. Every egg in which a dark movable black spot, little

larger than a pinhead, with numerous radiating blood vessels, is not distinctly visible should be discarded as worthless. Good strong eggs *only* will hatch good vigorous chicks. On the 14th day the strong eggs will be opaque and nearly black and if such an egg be held still before the tester, the embryo can be seen to move. Dead germs at this time contain either blood rings, blood streaks or are perfectly translucent and cloudy.*

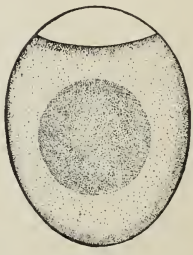
FIG. 4



Dead germ, 7th day



Fertile egg, 7th day



Infertile egg

The Hatch. After the last turning, close up the incubator and do not disturb it again, except to fill the lamp, until the hatch is over. As soon as all the chicks have dried off, open wide the ventilators, remove the egg tray and all the eggshells, and wedge open the door with a match stick so as to harden the little fellows. Darken the egg chamber by hanging a cloth in front of the glass door to keep chicks from picking at the droppings and each other's toes. After twenty-four (24) hours remove them to the brooder in a flannel lined and hooded basket. A chilling draught striking them at this time would prove disastrous.

The Brooder. There are a great many factors which enter into the ideal system of brooding, but the most important ones are:

1. Safety from fire.
2. Plenty of sunlight.
3. Ease of cleaning.
4. Roomy hover.
5. Plenty of scratching space for chicks to exercise in.
6. Good ventilation without draughts.
7. Easy maintenance of a uniform temperature.

* **Distinguishing the Sex.** It is held that a round egg will hatch a pullet, whereas a long, pointed egg will develop a lusty cockeral. After repeated experimenting, the author can assure the reader that the shape of the egg has nothing whatever to do with the sex of the embryo. There are no exterior indications whatever of the sex of the embryo.

8. Provision of means whereby the chicks can get away from the heat of the hover and into a cooler place.

9. Ease of caring for chicks.

All of the above points are self-explanatory, and need no further comment, but the writer desires to emphasize point No. 8. In a brooder where a place is provided so that chicks can get away from too much heat under the hover there is no danger of overheating, as the little fellows will go toward the cooler atmosphere. Under such conditions the heat can be kept a bit high to avoid all risks of chilling and the chicks will spread out where it is most comfortable.

Very often little chicks that have been out in the run will become cold and run into the brooder and under the hover to warm up. In order that they may warm up quickly a higher hover temperature is necessary than is ordinarily wanted by the flock. If the hover temperature is only just high enough to be comfortable for those chicks that have not been exercising out of doors, the chicks that have been outdoors and become rather cold will not find the hover temperature high enough to warm them up quickly. As a result they will crowd against their warmer fellows in order to get the benefit of their body heat, and the weak ones will be crowded off their feet, trampled on and smothered. But if the hover temperature is kept high enough to quickly warm up any chicks that may become chilled and a good sized scratching area provided outside the hover where the chicks can go after *becoming* thoroughly warmed, the evils of crowding will be done away with and the chicks will at all times adjust themselves to the degree of heat that suits them best.

It is like a man coming in from out of doors on a freezing winter day. He will rush to the hot stove to warm up and get the "chill out of his bones," but as soon as he has become well warmed he will go away from the stove and sit down. The glowing stove is hardly hot enough when he first comes in from out of doors, but it soon begins to feel too hot. So it is with chicks. It is cheaper to burn a little extra fuel than to have a lot of chicks killed by crowding. Outdoor exercise is essential to develop strong chicks, but they must have a place to go to warm up quickly when they get cold.

Preparing the Brooder. Previous to putting the chicks into the brooder the latter should be thoroughly scrubbed out with water and then sprayed with a good coal tar disinfectant. (See page 20.) After drying out, the heat should be turned on and the temperature under the hover regulated to 100° F. The floor of the brooder should be covered with fine sand and a board fixed so as to keep the chicks

FIG. 5

Chicks 10 days old in a portable gasolene-heated brooder house. The run is built in knock-down style.

penned close to the heat for a day or so, until they learn themselves to go under the hover when they get cold.

Although the little fellows are removed to the brooder after 24 hours, they are not fed for from 60 to 72 hours *after the hatch is completed.* When the chick leaves the shell its digestive apparatus contains a considerable amount of unabsorbed yolk. Until this is thoroughly digested and absorbed into the blood the chick's delicate little stomach is not ready to receive other food. If grains or mash are eaten too soon the digestive organs will become upset and diarrhoea result. One of the primary causes of diarrhoea in young chicks is that of feeding too soon after they are hatched. Another is overfeeding. Day-old chicks have been sent long distances without a bite to eat, and not only arrived in good condition but thrived better afterwards. This was due to the fact that they were good and hungry by the time they reached their destination. When the chicks are first taken to the brooder only a fountain of water is put before them. They will immediately begin picking at the sand on the floor and drinking water. This prepares and hardens the crop for the reception of other food.

For the first two days a grain mixture composed of equal parts of fine cracked wheat, fine cracked corn and steel cut oats is fed in a wooden chick hopper and left before them all the time so that they can pick away at the grains and thus learn how to eat. They will do a whole lot of picking at first, but really swallow very little. As soon as the chicks have learned to eat, scatter the grains on the sand for a day to teach them to scratch. Then put in a light litter of cut alfalfa or clover. From the time the litter is put in the chicks should be made to scratch for all their grain. Plenty of exercise keeps the system toned up and is the best preventative for the many ills to which little chicks are subject. Later on cut straw can be used instead of the cut clover or alfalfa, but for the first couple of weeks the latter is best, as the chicks will eat the finer parts and it will do them good. Pieces of straw would cause inflammation if taken into the crop at this tender time of the chick's life.

Beginning with the sixth day a dry mash composed of 2 parts of bran, 2 parts of shorts, 1 part of cornmeal or barley meal, 2 parts of beef scrap, 1 part of powdered bone, and .3 parts of powdered charcoal by weight is fed at 10 o'clock. For the next two weeks the litter is kept very deep and the grain mixture scattered in it early in the morning and about 2 o'clock in the afternoon with a feeding of dry mash at 10 a.m. As the chicks develop the dry mash should gradually

be left before them for longer intervals, until by the time they are from eight to ten weeks old they have access to the mash at all times.

As soon as possible the little fellows should be given an opportunity to run out of doors during fine weather. Contact with the ground and the exercise out of doors has a beneficial effect and causes the chicks to grow more rapidly. Just as soon as they have obtained sufficient size and age to do without heat they should be put in a summer house and given all the range possible. The grain ration and dry mash may then both be fed in hoppers and plenty of green food fed if it is not available on the range. Half grown chicks receiving plenty of range will be too busy chasing around after bugs and tender bits of herbage to over eat from the hoppers, and the fact that they can thus be hopper fed with the feed before them all the time will save a great deal of time and labor. However, if they must be kept in small yards throughout the season, it would be advisable and practically necessary to hand feed the mash and grain mixture at all times. The main point in feeding any kind of fowl, no matter what their age, is to see that they are never overfed and always get plenty of exercise, so that their bodies are always in a healthy condition and can easily digest the food eaten. Overfeeding, lack of exercise, and unsanitary conditions are bound to result in severe losses.

White diarrhoea is the worst foe the little chich has to fight. While there are two or three types of diarrhoea caused by bacteria and fungi, the principal and most common causes of ordinary diarrhoea are: (1) Overheating; (2) chilling; (3) feeding too soon; (4) overfeeding; (5) unsanitary conditions.

In removing the chicks from the incubator the operator must be very careful that the chicks are well protected from draughts and that they do not become chilled in that way. Again, he must be further careful that the heat in the brooder is kept sufficiently high for the first few days, so that the little chicks show their contentment by poking their heads through the curtain around the hover. A chill at this time is disastrous. However, after the first few days the heat can be gradually decreased without harm. To avoid overfeeding feed sparingly in a deep litter, and make the chicks exercise for all they get. To insure thorough sanitation, thoroughly spray the brooder before putting in each new lot of chicks with a 5 per cent solution of some good coal tar dip, clean out frequently, locate it so that plenty of sunlight enters where the chicks are, and on warm days give a good airing about noon.

SUMMARY

(1) Lack of vigor in breeding stock, (2) improper care of eggs for hatching, (3) faulty methods of incubation, (4) improper methods of brooding and feeding the chicks, and (5) bacterial or fungus diseases are the causes underlying poor results in the rearing of chicks. One or more of these causes is at the bottom of every failure to successfully pull the youngsters through the danger period. Study your problem carefully, eliminate every one of the above evils, and success will result. The rearing of chicks calls for intelligent and painstaking care 365 days of the year.

FORMULAE FOR LICE POWDER AND CRESOL DISINFECTANT

Lice Powder:

1½ pints gasolene;
½ pint commercial cresol;
4 quarts plaster of paris.

First, mix the gasolene and cresol together and then slowly stir in the plaster of paris until all the liquid is taken up. Use enough of the plaster of paris to absorb the liquid and no more. Spread the resulting brownish powder on sheets of paper to dry and then store away in covered cans. To use, take a large baking powder can, punch the cover full of holes with a six-penny nail and fill the can with the powder. This makes a good sifter to thoroughly sift the powder into the feathers around the vent and under the wings, while an assistant is holding the hen up by the shanks. Work the powder into the feathers with the fingers. This is one of the best powders the writer has ever used. It is also one of the cheapest.

Cresol Disinfectant:

3½ quarts raw linseed oil;
1 lb. 6 ozs. commercial lye or Babbitt's potash;
½ pint water;
8½ quarts commercial cresol.

Take a clean five-gallon stone crock and pour into it the three and one-half quarts of raw linseed oil. Then dissolve the commercial lye in just enough water to thoroughly dissolve it—one-half pint is usually sufficient. Allow the lye solution to stand a few hours until cold. Then pour it very slowly, constantly stirring, into the crock of linseed oil. Take four or five minutes in adding the lye solution to the linseed oil. Continue stirring for 20 to 30 minutes until a smooth, thick soft soap is formed. Then stir in the commercial cresol, which will dilute and blend with the soap to form a clear, red brown liquid.

A 3 per cent mixture of the above stock solution is strong enough for all ordinary disinfection, as cresol is extremely powerful in its action. When diluted in this way a thin milky liquid results, which can be applied with brush or spray pump. The latter is best, because with it the disinfectant can be forced into every crack and crevice, thus insuring a perfect job.